Introduction

North Carolina is endowed with numerous, ecologically diverse and resource-rich coastal rivers, bays, and estuaries. Among these are the Albemarle and Pamlico Sounds, area-wise the second largest sound system in the Continental United States. Tributaries feeding both estuaries and sound systems are discharging ever-increasing loads of both nitrogen and phosphorus as North Carolina's agricultural, industrial and urban sectors grow and diversify. Annual loading of total nitrogen and total phosphorus to the Neuse River has been estimated to have increased by about 60-70% over the past century (Stanley 1988). Accelerated nutrient loading, particularly over the past two to three decades, has ushered in some ominous and increasingly common symptoms of eutrophication, which to our best knowledge, were extremely rare prior to World War II. Included are: 1) increasing incidences of deoxygenation in sediments and bottom waters of slow-moving, nutrient-laden freshwater river systems and associated oligohaline to euhaline estuaries (including the Chowan, Pamlico and Neuse Systems) (Dubach 1977; N.C.D.N.R.C.D. 1980; Paerl 1987), 2) more frequent and more intense algal bloom activity, particularly of surface scum-forming nuisance blue-green algae, in both the Chowan and Neuse Rivers (Witherspoon et al. 1979; Paerl 1983; 1987), and 3) periodic, and at times persistent, outbreaks of fish and shellfish disease or mortality in the more eutrophic segments of rivers and estuaries (Esch and Hazen 1983; Copeland and Gray 1989; Levine et al. 1990). Research has suggested such outbreaks may be related to toxic reaction to H_2S buildups in sediments, viral and fungal infections (Sea Grant U.N.C. 1982), or dinoflagellate and blue-green algal